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Review Article

PHARMACOLOGICAL POTENTIAL OF *ERIOBOTRYA JAPONICA* – AN OVERVIEW

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ABSTRACT

Eriobotrya japonica Lindl. (Rosaceae) is native to southeastern China and evergreen large shrub or small tree, with a rounded crown, short trunk and woolly new twigs. Loquat syrup is used in Chinese medicine for soothing the throat like a cough drop. The Loquat plant is having an anti-inflammatory, hypoglycemic, antioxidant, antitumor, antiviral, cytotoxic, antimutagenic, chronic bronchitis, nephropathy, NF kappa B inhibitor, hypolipidemic activity. Seeds and young leaves of the plant are slightly toxic, containing small amounts of cyanogenic glycosides (including amygdalin) which release cyanide when digested, though the low concentration and bitter taste normally prevents enough being eaten to cause harm. This review explains the pharmacological potential of this plant which helps the researchers to establish more potential of this important plant.

KEYWORDS: *Eriobotrya japonica*, Antioxidant, Antidiabetic, Amygdalin, Ursolic acid, Sesquiterpenes

INTRODUCTION

Eriobotrya japonica Lindl. (Family Rosaceae) is widely refined in subtropical regions of China, Japan, India and Mediterranean area[1]. Other names are *Mespilus japonica*, *Photinia japonica*, *Folium eriobotryae*. The history of loquat cultivation is more than 2000 years old, since the Chinese Han dynasty (100 B.C.)[2]. The harvest season of loquat in China lasts from the end of April to the middle of June when the market is short of fresh fruit[3], so loquat fruit usually has a high market value. But loquat fruit are susceptible to decay, moisture and nutritional losses during their postharvest life. The quality of loquats, including color, flavor, aroma and chemical compounds etc., are highly dependent on the ripening degree at harvest[4]. Volatiles of fresh loquat fruit contain 78 compounds. Among them, 15 compounds significantly contribute to the aroma, and the most potent aroma compound in fresh loquat is phenylacetaldehyde. Additionally, other aroma compounds, hexanal, (E)-2-hexenal, hexanoic acid, β-ionone are also important[5].

The skin color of loquat fruit shows a marked change from green to yellow during development and maturation and from yellow to deep orange during ripening. So the skin color is generally used as a parameter for harvest. In general, high quality loquat fruit have soluble solids content (SSC) >12%, moderate titratable acid (TA) from 0.3 to 0.6% and low flesh firmness[6]. The reported bioactive components of *Eriobotrya japonica* include Flavonoids[7], Triterpenic acids[8] and carotenoids[9]. The isomeric pentacyclic oleanolic acid (OA) and ursolic acid (UA) are predominant triterpenoids found in *E. japonica* leaves[10]. Based on pharmacological tests, both OA and UA have been proved to have bioactivities such as anti-inflammatory[11], diuretic, anti-tumor[11], hepatoprotective[12] and anti-HIV[13]. Amygdalin, a cyanogenetic glycoside, was found to be present in loquat leaf and kernel in considerable amount[14]. The loquat flower extract contains oleanic acid, ursolic acid and amygdalin[15]. The fruit contains sugars: levulose and sucrose, citric acid, tartaric acid, succinic acid, cryptoxanthin, β- carotene, neo-β-carotene. The seeds contain amygdalin and fatty oil[16].

Pharmacological Activities of *Eriobotrya japonica*

Anti-diabetic activity

The sesquiterpene glycoside isolated from the leaves of Loquat plant acts as hypoglycemic agent[17]. Extracts from these leaves have been reported to exhibit a significant hypoglycemic effect[18]. Leaf extracts of the loquat plant inhibit 11β-HSD1 over 11β-HSD2 this will contribute to the antidiabetic effect of the loquat plant. The 11β-HSD1 is the Glucocorticoid activating enzyme 11β-hydroxysteroid dehydrogenase[19]. The leaf extract of the plant is also used as oral hypoglycemic agent which is used in diabetes and diabetic cardiovascular complications have been used in clinical practice in South East Asia especially China, Japan and Korea[20-21]. The various parts of the plant have proved to be antidiabetic[22].

Hypolipidemic activity

Hypercholesterolemia is often associated with obesity, diabetes mellitus and hypertension, each and all contribute to elevated cardiovascular mortality[23]. Loquat (*Eriobotrya japonica)* leaf extracts have successfully shown anti-oxidant and anti hypercholesterolemic properties. Hypolipidemic properties were assessed in a double blinded- randomized clinical study carried out among 41 human volunteers with hyperlipidemia values. The volunteers were divided into three groups. They were asked to continue their usual diet and medications unchanged and were evaluated for efficacy and tolerability of Cholevel for 3 months[24]. Antiatherogenic and antioxidant activities of extracts from leaves of the plant[25].

Antioxidant activity

The antioxidant capacity of Loquat plant were evaluated using the Trolox equivalent antioxidant capacity (TEAC) and ferric reducing antioxidant power (FRAP) assays, and their total phenolic content was measured by the Folin-Ciocalteu method. The strong correlation between TEAC value and FRAP value suggested that the antioxidants in this plant possess free radical scavenging activity and oxidant reducing power, and the high positive correlation between antioxidant capacities and total phenolic content. Loquat shows very high amount of antioxidant property and is a potential source of natural antioxidant[26]. Seed extract also shows antioxidant activity[27]. Loquat contain significant amounts of secondary plant metabolites, including carotenoids, flavonols, anthocyanins, and procyanidins. These minor dietary compounds have been postulated to play a key role in humans as antioxidants, by preventing reactions produced by oxygen and nitrogen reactive species during the progression of different human pathologies. The antioxidant activity is measured by the Randox spectrophotometric kit. Trolox (Sigma) was used as a reference antioxidant, antioxidant activity was expressed as Trolox equivalents. It is cloncluded that it is recommendable to incorporate loquat in the diet to benefit of his high antioxidant activity[28].

Antiviral activity

The phytochemicals found in the plant such as oleanolic acid, pomolic acid, and structurally related triterpenoids have also anti HIV activity and 3-O-acyl ursolic acid derivatives is effective against AIDS virus[13].

Cytotoxic activity

Three new flavonoid glycosides, together with 15 known flavonoids, have been isolated from the leaves of *Eriobotrya japonica*, and characterized as (2*S*)- and (2*R*)-naringenin 8-*C*-a-L rhamnopyranosyl-(12)-b -D-glucopyranosides, and cinchonain Id 7-*O*-b -D-glucopyranoside, respectively, based on spectral analyses including two dimensional (2D) NMR techniques. Higher proanthocyanidin fraction in the water-soluble portion of the extract was characterized as a procyanidin oligomer mixture mainly composed of undecameric procyanidin. These polyphenols have also been assessed for cytotoxic activity against two human oral tumor (human squamous cell carcinoma and human salivary gland tumor) cell lines. Selective cytotoxicity of the procyanidin oligomer between tumor and normal gingival fibroblast cells[29].

Liver function improvement

Eriobotrya japonica evaluation of the pharmacological efficacy of the seed extracts, constituents of the seeds were found to contain the unsaturated fatty acids linolenic and linoleic acids and the sterol b -sitosterol in the 70% EtOH and the MeOH extracts. The seed extracts were orally administered to rats with dimethylnitrosamine-induced hepatopathy, and blood L-asparate aminotransferase (AST) and L-alanine aminotransferase (ALT) levels, liver retinoid level, and hydroxyproline level were measured. Liver fibrosis rates calculated after Azan-Mallory staining and evaluation of the liver function- improving effects of extracts were showed that AST, ALT, and hydroxyproline levels and liver fibrosis rates were significantly lower, and retinoid levels were significantly higher in hepatopathic rats treated with 70% EtOH and MeOH extracts of the seed than in water-treated control rats. This suggests that the positive effect on liver function of the extracts varies depending on the extracting solvent used. 70% EtOH and MeOH extract of the seeds inhibited the development of liver fibrosis in hepatopathic rats, thus exhibiting potent improvement. The unsaturated linolenic and linoleic acids and the sterol b -sitosterol contained in these extracts may also contribute to the improvement of liver function[30.]

Antimutagenicity

Ursolic acid is isolated from the ethanolic extract of the plant decreased the numbers of *Salmonella typhimurium* TA 100 revertants per plate thus showing antimutagenic activity[31].

Other activities

The leaves extract of the plant also shows antispasmodic activity. They are prescribrd in coryza, hyperemesis, especially vomiting in pregnancy, epistaxis and dyspepsia[32]. Corosolic acid had significant effects on glucose transport across cell membranes[33]. Proanthocynidin is hydrolysable tannin isolated from Loquat plant has anti *Helicobactor pyroli* activity[34]. A decoction of the leaves has been known to be a cooling beverage preventing sunstroke and thirst, and has also been applied locally to wounds, ulcers and cancers[35], The triterpene isolated from loquat plant shows having antitussive activity[36]. The Different organs of the loquat tree have been used Anti-Inflammatory[37], Tumors[36], Chronic Bronchitis[38], Nephropath [39], NF kappaB inhibitor[40].

CONCLUSION

Plants are well known and have possible source of curing aliments from the time of immemorial. In recent years, ethno-botanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. The present review shows the pharmacological potential of *Eriobotrya japonica* which is very helpful for researcher.

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